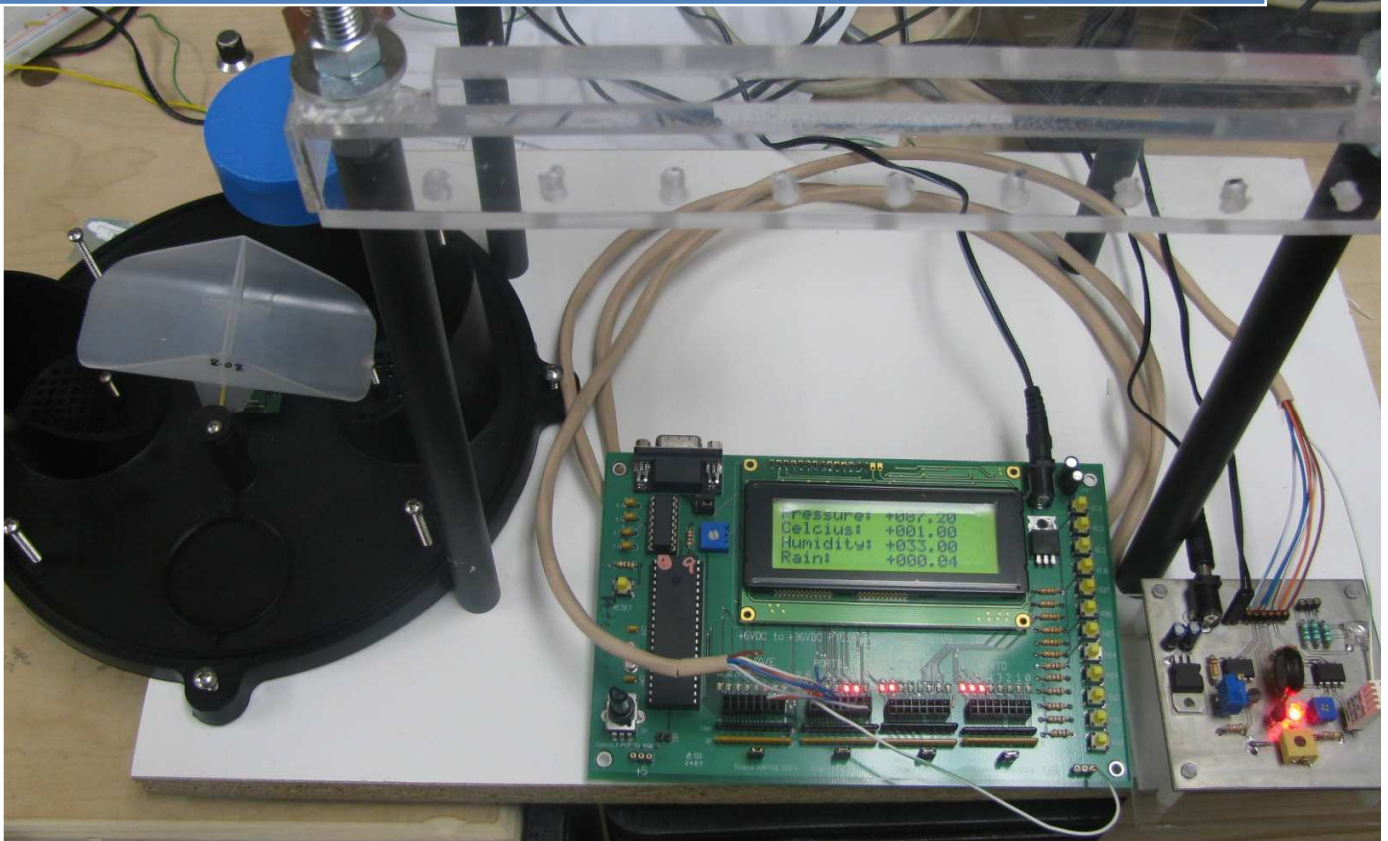


User's Manual

Weather Station for RFID Study



Dan Peterson

Ashish Roy

Divyanshu Narendra

Advisor: Dr. Glower

SD0920

Overview:

This product is designed to measure temperature, humidity, atmospheric pressure and has a build-in day/night sensor on-board. It also has the capability of measuring wind speed. The main purpose of this product was to aid in keeping track of atmospheric changes so that RFID tags can be studied in regard to the change of their sensitivity with change in weather. This product sends the data to a PIC (a microprocessor with an on-board LCD screen) which displays temperature, pressure, rainfall and humidity (instantaneous value) and this PIC sends the values to a PC which records and keeps track of all the data which can be saved in a text file.

The data being saved has to further be saved as a text document (this has to be done manually by the client/user) and can use this data to plot it using any kind of software designed to do so (MS excel, MATLAB etc.) to see the changes over a certain time period. Also, in addition the user can manually change the time period after which the data is being recorded. As a default setting, the product has been designed to send data after every 1 second.

The product has been designed to withstand a sufficient amount of wind without tripping over because of the solid wooden base, and also has been built in such a way so as to withstand rainfall without the circuit being hampered in any way. The PIC however has to be kept inside as it is not weather proof. Moreover the PCB can be taken out and checked for any problems since it is attached to the transparent glass using a Velcro for this very specific purpose.

Requirements:

PC with windows 98/xp/vista and a pre-installed program of hyperterminal

And a serial port on-board so as to connect it with the PIC

(<http://venus.ece.ndsu.nodak.edu/~glower/ECE376/DataSheets/PIC18F2525.pdf>)

Working with the Product:

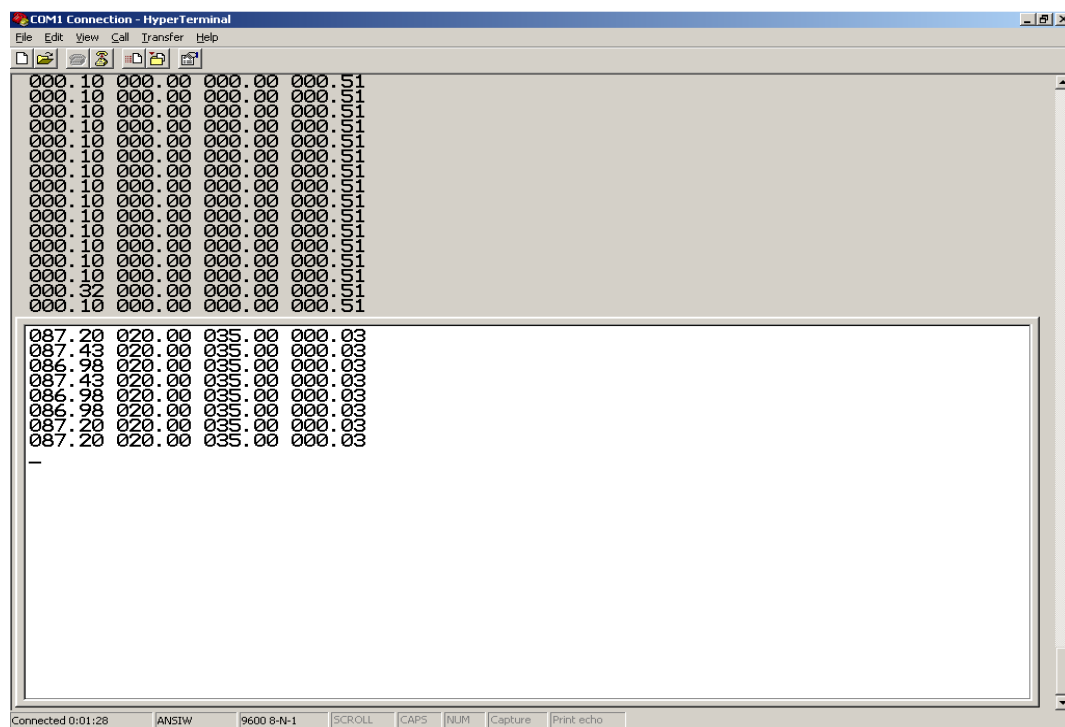
QUICK START:

1. Connect the power adapter to the PCB
2. Connect the PIC to the PC
3. Start up the PC

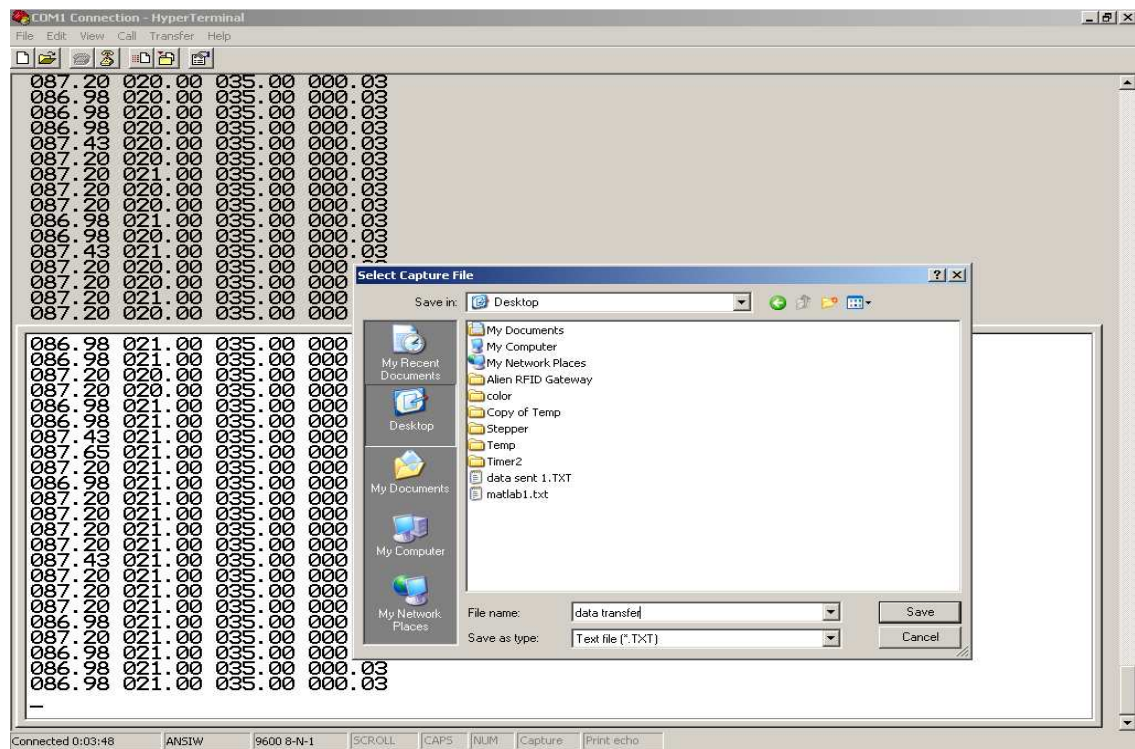
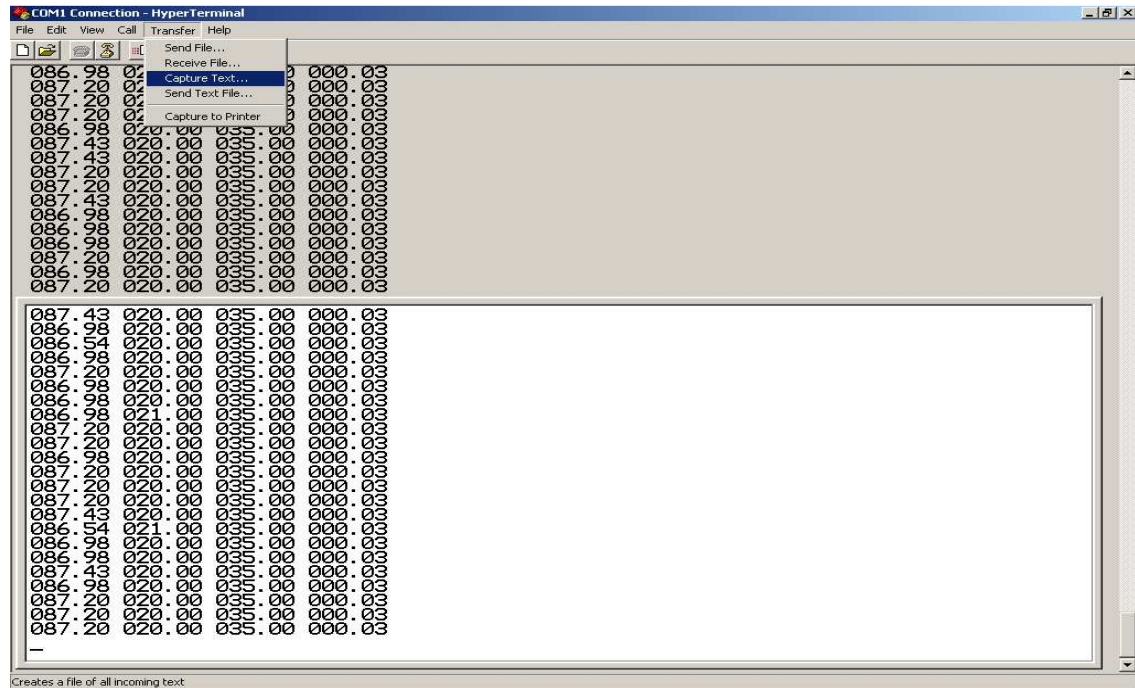
4. Start hyperterminal
5. Check to see if data is being received

Getting started with Hyperterminal:

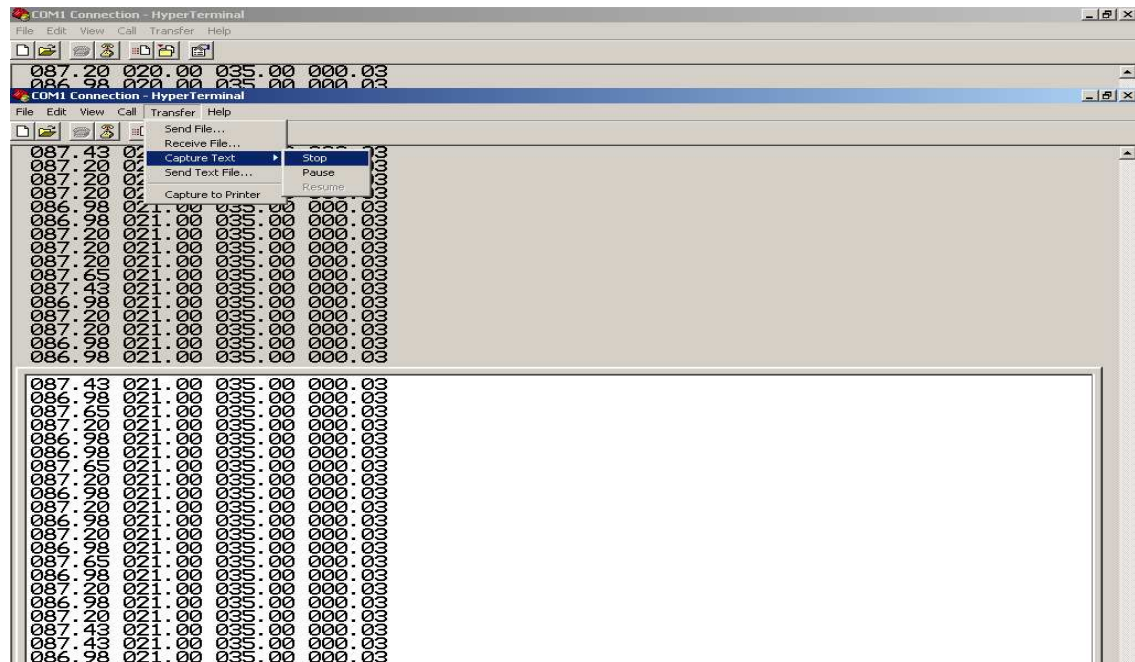
1. As soon as you start up hyperterminal, and start the PCB and the PIC it starts displaying data as it simultaneously records it off the PIC.



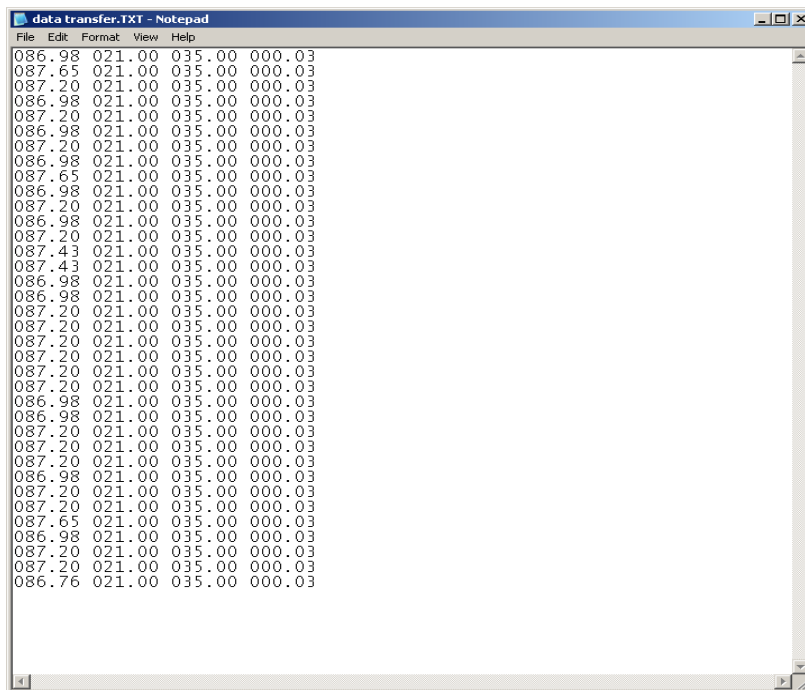
2. Capturing the data in a text file, after clicking on capture text you can name the text file and all the data will be saved in it:



3. Stopping the flow of data (In case you are done recording all the data). You can also pause the data transfer by selecting the option pause, but then make sure you save the new data in a different text file so that you can keep track of time by right-clicking on the text fil and selecting properties.



4. When you open the text file, the data is displayed as follows:

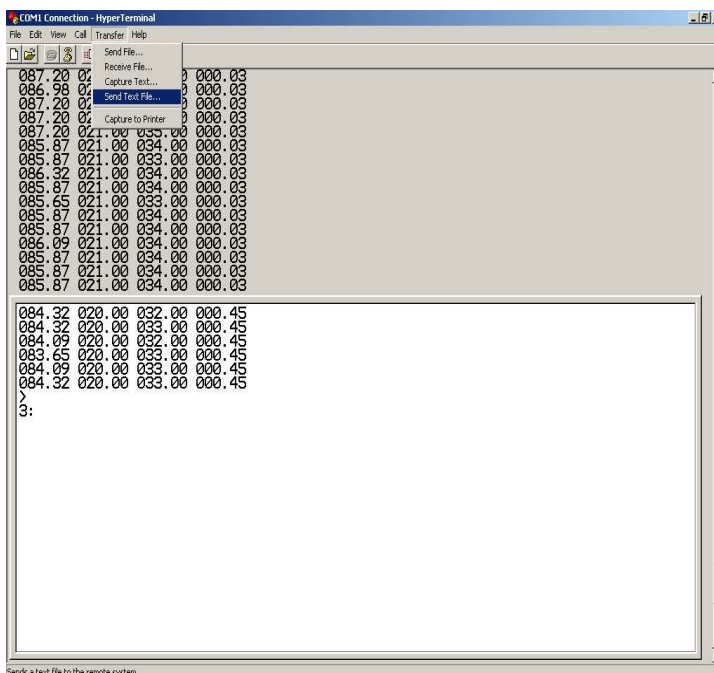


```
data transfer.TXT - Notepad
File Edit Format View Help
086.98 021.00 035.00 000.03
087.65 021.00 035.00 000.03
087.20 021.00 035.00 000.03
086.98 021.00 035.00 000.03
087.20 021.00 035.00 000.03
086.98 021.00 035.00 000.03
087.20 021.00 035.00 000.03
086.98 021.00 035.00 000.03
087.65 021.00 035.00 000.03
086.98 021.00 035.00 000.03
087.20 021.00 035.00 000.03
086.98 021.00 035.00 000.03
087.20 021.00 035.00 000.03
086.98 021.00 035.00 000.03
087.43 021.00 035.00 000.03
087.43 021.00 035.00 000.03
086.98 021.00 035.00 000.03
086.98 021.00 035.00 000.03
087.20 021.00 035.00 000.03
087.20 021.00 035.00 000.03
087.20 021.00 035.00 000.03
087.20 021.00 035.00 000.03
087.20 021.00 035.00 000.03
086.98 021.00 035.00 000.03
086.98 021.00 035.00 000.03
087.20 021.00 035.00 000.03
087.20 021.00 035.00 000.03
087.20 021.00 035.00 000.03
086.98 021.00 035.00 000.03
086.98 021.00 035.00 000.03
087.20 021.00 035.00 000.03
087.20 021.00 035.00 000.03
087.20 021.00 035.00 000.03
086.98 021.00 035.00 000.03
087.20 021.00 035.00 000.03
087.20 021.00 035.00 000.03
087.20 021.00 035.00 000.03
086.98 021.00 035.00 000.03
087.20 021.00 035.00 000.03
087.20 021.00 035.00 000.03
086.98 021.00 035.00 000.03
087.20 021.00 035.00 000.03
086.76 021.00 035.00 000.03
```

OTHER FUNCTIONS:

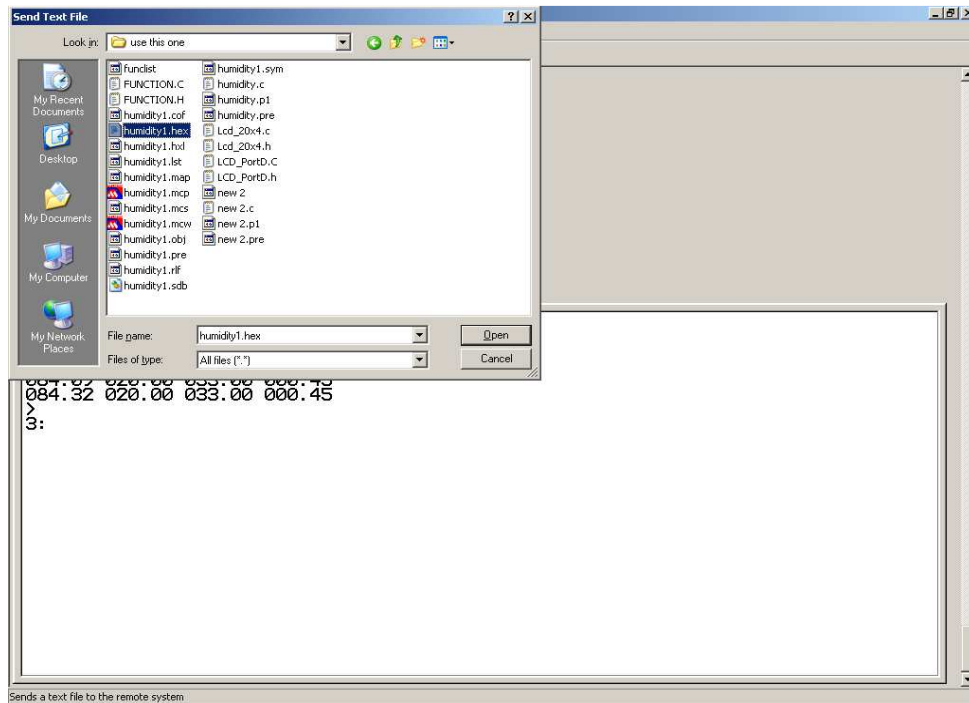
How to send a file using Hyperterminal:

1. Open hyperterminal, select the option send text file as shown below:



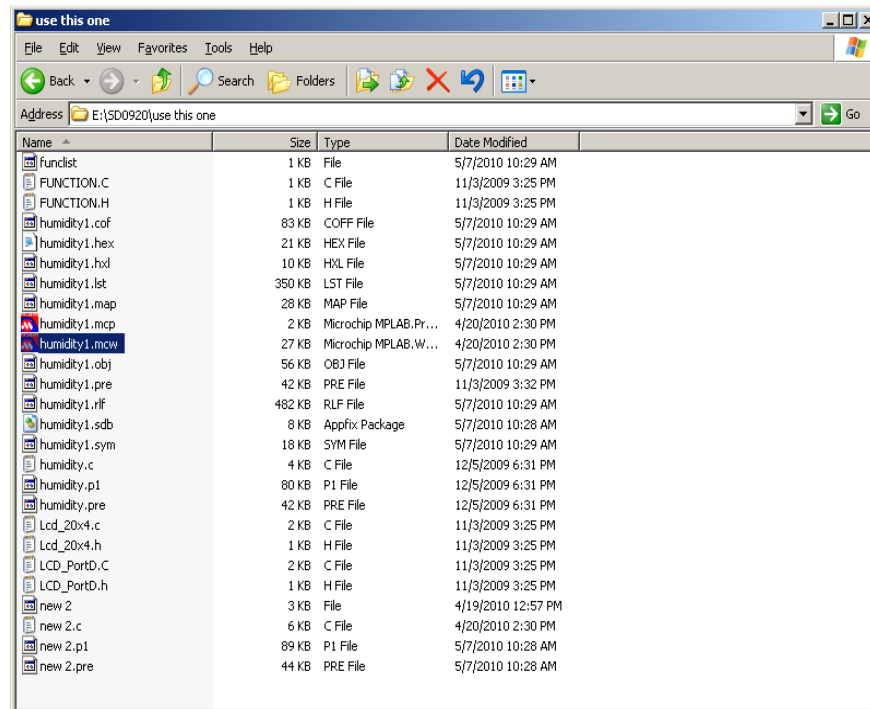
```
COM1 Connection - HyperTerminal
File Edit View Call Transfer Help
Send File...
Receive File...
Capture Text...
Send Text File...
Capture to Printer
087.20 021.00 035.00 000.03
086.98 021.00 035.00 000.03
087.20 021.00 035.00 000.03
087.20 021.00 035.00 000.03
087.20 021.00 035.00 000.03
085.87 021.00 034.00 000.03
085.87 021.00 033.00 000.03
086.32 021.00 034.00 000.03
085.87 021.00 034.00 000.03
085.65 021.00 033.00 000.03
085.87 021.00 034.00 000.03
085.87 021.00 034.00 000.03
086.09 021.00 034.00 000.03
085.87 021.00 034.00 000.03
085.87 021.00 034.00 000.03
085.87 021.00 034.00 000.03
084.32 020.00 032.00 000.45
084.32 020.00 033.00 000.45
084.09 020.00 032.00 000.45
083.65 020.00 033.00 000.45
084.09 020.00 033.00 000.45
084.32 020.00 033.00 000.45
>
3:
```

2. Select the file to be sent, in this case it is humidity1.hex



How to manipulate the time after which data is being recorded in hyperterminal:

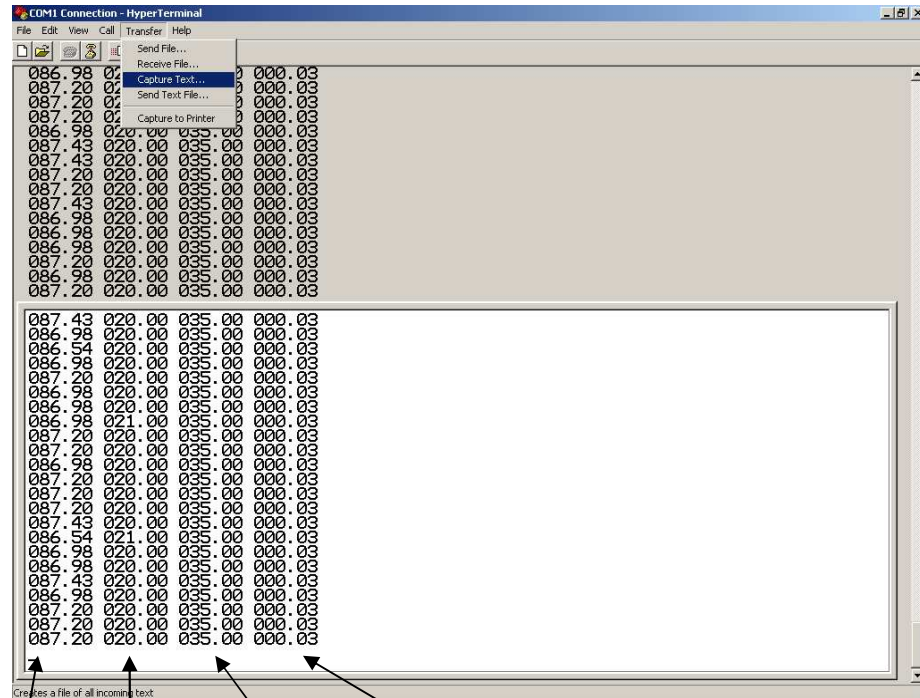
1. Select the file to be manipulated, in this case it is humidity1.mcw



2. A window will open up showing the entire program in C language, look for `wait_ms()`, this function controls the time after which each data package is received by the PC. Looking at default settings, it's value should be 1000 (eg: `wait_ms(1000)`) which implies that data is being received after every 1000 milliseconds or 1 second. You can modify this number according to your liking, for eg.: changing its value to 6000 would change the default value to 6 seconds, so the hyperterminal will display a new set of values after every 6 seconds)
3. Press `Ctrl + F10`, if build is successful transfer it to the PIC which can be done in a similar fashion as shown in previous section (do choose the .hex file extension of this file as the PIC microprocessor only reads .hex extension)

How to read data and manipulate it

This is a typical screen shot of a data being shown on the PC.



Pressure (in KPa)

temperature (in degree Celcius)

Relative Humidity (in %)

Rainfall measurment

interpreting values:

For Rainfall:

Eg: 000.03 this implies there have been 3 drops of rainfall been recorded so far, 1 drop=0.01 of an inch(“).

Also, 001.00 would mean 100 drops of rainfall have been recorded so far.

For Pressure:

Eg: 70.89 would mean that the current atmospheric pressure is 87.20 KPa or kilo Pascal.

For Temperature:

Eg: 31.00 would mean the current temperature is 31 degree Celcuis.

For Humidity:

71.00 would mean that the relative humidity is 71%.

NOTE: The Text file records the data in the same pattern, and the values are displayed in a similar fashion.

TROUBLESHOOTING:**If no data is being recorded by the PIC**

- One of the reasons for this could be that the ground in the PCB is not connected to the ground plug-in in the PIC, make sure that the wire that touches the bottom half of the PCB (the side that only has the day/night sensor soldered on it) is connected to the plug-in on the PIC that says GND. Make sure that color coding of all the wires is correct.
- If the above mentioned step still does not produce any result, that means that something might be wrong with the PCB, take the PCB out of the encasing and check for short-circuit using a multi-meter alongside each of the sensors, making sure each of them is giving some kind of output. If for some reason one of them fails to give an output, then this would be an indication that this particular part has to be replaced.

If the PIC displays a blank screen:

- One of the chief reasons for this would be that somehow the PIC has been reset, and this would mean that you would have to reload the program in the PIC once again. This can be done using the steps as illustrated in previous sections.